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ABSTRACT

This booklet is intended to help mainstreamed mentally retarded, emotionally disturbed, or learning disabled high school students acquire a basic understanding of the responsibilities and working conditions of painters and to practice basic math skills necessary in the occupation. The first section provides a brief introduction to the occupation by focusing upon those job tasks of a painter with which the student is likely to be familiar. The next two sections deal with the work environment of the typical painter and the training, education, and experience needed for the occupation. Exercises addressing basic math skills used by painters are provided. Various suggestions are listed for students interested in further exploring the occupation of painter. A glossary and answer sheet conclude the booklet. (KC)

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MATH on the job

Painter

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MATH ON THE JOB:

PAINTER

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MATH on the job

Painter

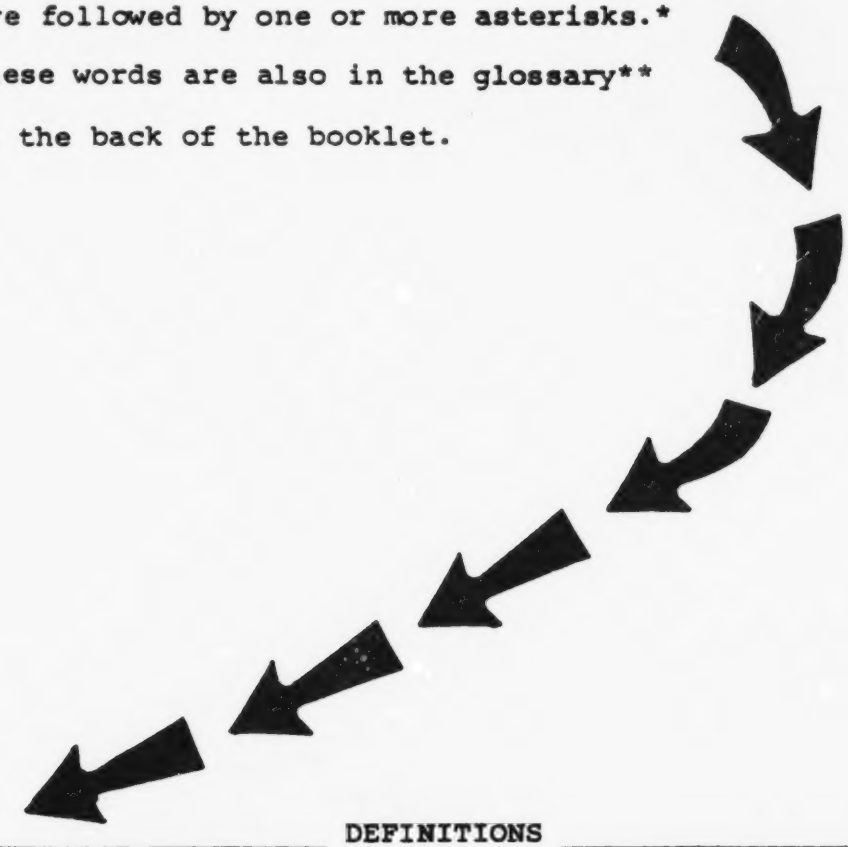
In this booklet, you can--

- find out what a painter does
- see how a painter uses math
- get a chance to use math as a painter
- find out the type of things a painter needs to know
- find out what courses, training, and experience you need to become a painter

SPECIAL WORDS USED IN THIS BOOKLET

Workers in many jobs use special words or special meanings for words. Learning these words helps you to learn about a job.

You will find some of these special words in this booklet. When these words, and some hard words, are used for the first time, they are followed by one or more asterisks.* These words are also in the glossary** at the back of the booklet.



DEFINITIONS

*An asterisk (*) is a symbol that tells you to look at the bottom of the page for the meaning, or definition, of the word.

**A glossary is a list of words with their meanings.

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HAVE YOU EVER...

- painted a picture at school or at home?
- watched a house painter work?
- washed a wall?
- chosen a color of paint to match furniture or curtains?
- visited a paint store?

If you have, then you have some idea about the work of a painter. This booklet will help you learn more about the work of a painter and how math is important to do the job.

WHAT DOES A PAINTER DO?

The main task of a painter is to apply paint, stains, or varnishes to the inside or outside of buildings. A painter does this by--

- loosening old paint with heat or chemicals
- removing the old paint with sandpaper or a wire brush
- cleaning the surface and removing any grease
- filling nail holes and cracks
- using sandpaper to remove any rough spots
- brushing off any dust
- mixing the paint to match the desired color
- using brushes, rollers, or spray guns to apply the paint
- cleaning the tools that were used

The surfaces a painter paints can be--

- wood
- concrete
- metal
- plastic
- masonry*

DEFINITION

*__Masonry__ is something built with stones or bricks.

Math is very important to the work of a painter. As a painter, you--

- count
- add, subtract, multiply, and divide
- use whole numbers, fractions, and decimals
- tell time
- compute percentages
- compare numbers
- measure distance
- compute **areas***
- calculate the amount and cost of supplies
- calculate labor costs

DEFINITION

*An <u>area</u> is the amount of surface to be covered when you paint a room, a wall, or a ceiling. The surface is measured in square units (for example, square inches, square feet, or square yards).

A painter uses math to measure area.

EXAMPLE

Before paint can be bought, a painter must figure out the area of the surface to be painted.

Let's assume a painter is painting a wall 16 feet long and 8 feet high. What is the area of the wall? To find the area, use the formula for finding the area of a rectangle:

Area = length x width

16 feet x 8 feet = 128 square feet

The area of the wall is 128 square feet. (Remember: area is measured in square units such as square inches or square feet.)

NOW YOU TRY IT

Practice Exercise A

1. What is the area of a wall 17 feet long and 8 feet high?

2. What is the area of a wall 13 feet long and 9 feet high?

3. What is the area of a billboard 20 feet long and 13 feet high?

4. A side of a building is 55 feet long and 75 feet high. What is the area?

5. A side of a building is 60 feet long and 95 feet high. What is the area?

6. A living room wall is 22 feet long and 12 feet high. What is the area?

A painter uses math to figure out the amount of materials needed.

EXAMPLE

Paint is sold in gallon, quart, and pint cans. The can size and the number of cans needed varies with the size of the surface area to be painted. The chart below lists each can size and the amount of surface area it covers.

Can Size	Surface Area Covered
gallon	200 square feet
quart	50 square feet
pint	25 square feet

How many quarts of paint are needed to paint an area of 135 square feet? To find this amount, divide the number of square feet to be painted by the number of square feet a one-quart can of paint can cover:

135 square feet ÷ 50 square feet = 2.7

Since paint is not sold in partial cans, you would need 3 quarts of paint to cover 135 square feet.

NOW YOU TRY IT

Practice Exercise B

Use the chart above to answer the questions which follow.

How many quarts of paint are needed to paint an area of--

7. 100 square feet?
8. 150 square feet?
9. 190 square feet?

How many gallons of paint are needed to paint an area of--

10. 400 square feet?
11. 570 square feet?
12. 1,600 square feet?

How many pints of paint are needed to paint an area of--

13. 75 square feet?
14. 45 square feet?
15. 200 square feet?

A painter uses math to figure out the costs of materials and labor.

EXAMPLE

A painter used 4 gallons of paint and took 6 hours to paint a small garage. A gallon of paints costs $8.35. The painter charges $12.00 an hour for labor. What is the total cost for materials and labor?

To find the total, first find the cost of materials. Multiply the cost of a gallon of paint by the number of gallons used:

$8.35 x 4 = $33.40 = cost of materials

Next, find the cost of labor. Multiply the charge for each hour of labor by the number of hours worked:

$12.00 x 6 hours = $72.00 = cost of labor

To find the total cost of materials and labor, add the labor cost and the materials cost together:

$33.40 + $72.00 = $105.40

The total cost for materials and labor is $105.40.

NOW YOU TRY IT

Practice Exercise C

One gallon of paint costs $9.98. The labor charge per hour is $12.50. Find the total cost for each problem.

	Paint Used (in Gallons)	Cost of Materials	Hours Worked	Cost of Labor	Total Cost
16.	4	?	6	?	?
17.	5	?	8	?	?
18.	11	?	10	?	?
19.	13	?	11	?	?
20.	22	?	35	?	?
21.	43	?	64	?	?

A painter uses math to mix materials.

EXAMPLE

Sometimes painters mix paints to make their own specially colored paint. To make a paint called Daytona Beach, the painter might mix 1 part white paint, 1 part blue paint, and 2 parts yellow paint.

If a painter mixes a gallon of Dayton Beach paint, how much of each color is used? Follow these steps:

Step 1: Add up the total number of parts:
$1 + 1 + 2 = 4$ parts

Step 2: Find the measurement for each part by dividing the total measurement of the mixture by the total number of parts:
1 gallon $\div$ 4 parts = 1 quart/part

Step 3: Multiply the measurement per part by the color's number of parts in the mixture:
White: 1 part x 1 quart/part = 1 pint
Blue: 1 part x 1 quart/part = 1 pint
Yellow: 2 parts x 1 quart/part = 2 quarts

One quart of white, 1 quart of blue, and 2 quarts of yellow paint make one gallon of Daytona Beach paint.

NOW YOU TRY IT

Practice Exercise D

To mix Daytona Beach paint, a painter mixes 1 part white, 1 part blue, and 2 parts yellow paint.

22. If a painter mixes 2 gallons of paint, how much of each color is used?

23. A painter mixes 3 gallons of paint. How many quarts of each color are used?

24. A painter mixed 4 gallons of paint. How many gallons of each color were used?

25. A painter used 2 gallons of white paint to mix an 8-gallon batch. How many gallons of blue and yellow paint were used?

26. A painter used 16 gallons of yellow paint to mix a batch. How many gallons of white paint were used? How many gallons were in the batch?

WHERE DOES A PAINTER WORK?

As a painter, you will probably work for a painting contractor. When you become an experienced painter, and if you have the necessary money, you might want to become a contractor yourself.

You probably will paint many different kinds of structures. You may paint--

- houses
- barns
- garages
- office buildings
- factories
- warehouses
- schools
- hospitals
- stores
- apartment houses
- fences

You may paint both the inside and outside of structures. Or you might do only one type of painting.

You will work with many different people, such as customers, supervisors, and other painters. The customers are the people who own the structures and they will tell your supervisor what they want painted. Often, customers will watch you while you work and ask you questions about what you are doing. It is very important that you be nice to the customers while you continue working.

As a painter, you will use special tools and equipment. You will use--

- a scraper, wire brush, or sandpaper to remove loose paint
- drop cloths to cover furniture and floors
- brushes of different sizes to paint **trim*** and hard-to-reach areas
- rollers to paint on large, even surfaces, such as walls or ceilings
- spray guns to paint difficult surface, such as cinder block and metal fences
- ladders to reach the upper parts of the walls or ceilings
- **scaffolding**** to paint the outsides of tall buildings

DEFINITIONS

*Trim is the woodwork around doors and windows.

**A scaffold is a temporary or moveable platform that workers stand or sit on when working at a height above the floor or ground.

In addition to house and building painters, there are other kinds of painters.

- A production painter applies varnish, lacquer, or paint to manufactured metal or wood products. The production painter usually works on an assembly line. Often, a production painter uses either a spray gun or a painting machine.

- An automotive painter paints old and damaged motor vehicles so they will look like new. He/she mixes paint to match the original color. After using a spray gun to apply the paint, special heat lamps or fans are used to help the paint dry quickly. Then the automotive painter sands and polishes the surface.

- A shipyard painter paints the parts, equipment, insides, and outsides of ships, boats, and shipyard buildings.

- A sign painter lays out and paints letters and designs to create signs. The sign painter usually uses a stencil* to make the letters and designs.

DEFINITION

*A <u>stencil</u> is a sheet with a cut pattern.

IF YOU ARE INTERESTED IN

THE WORK OF A PAINTER

AND WOULD LIKE TO KNOW MORE,

READ ON

WHAT TRAINING, EDUCATION, AND EXPERIENCE DO YOU NEED TO BECOME A PAINTER?

What do you think? Would you like to be a painter? If you would, there are some things you should know.

You should know--

- the different types of paints and when they are used
- the colors that look nice together
- how to mix paint to make new colors or match an old color
- how to read **blueprints***
- how to use tools

While you are in high school, you should take courses in art, industrial art, chemistry, mathematics, and geometry.

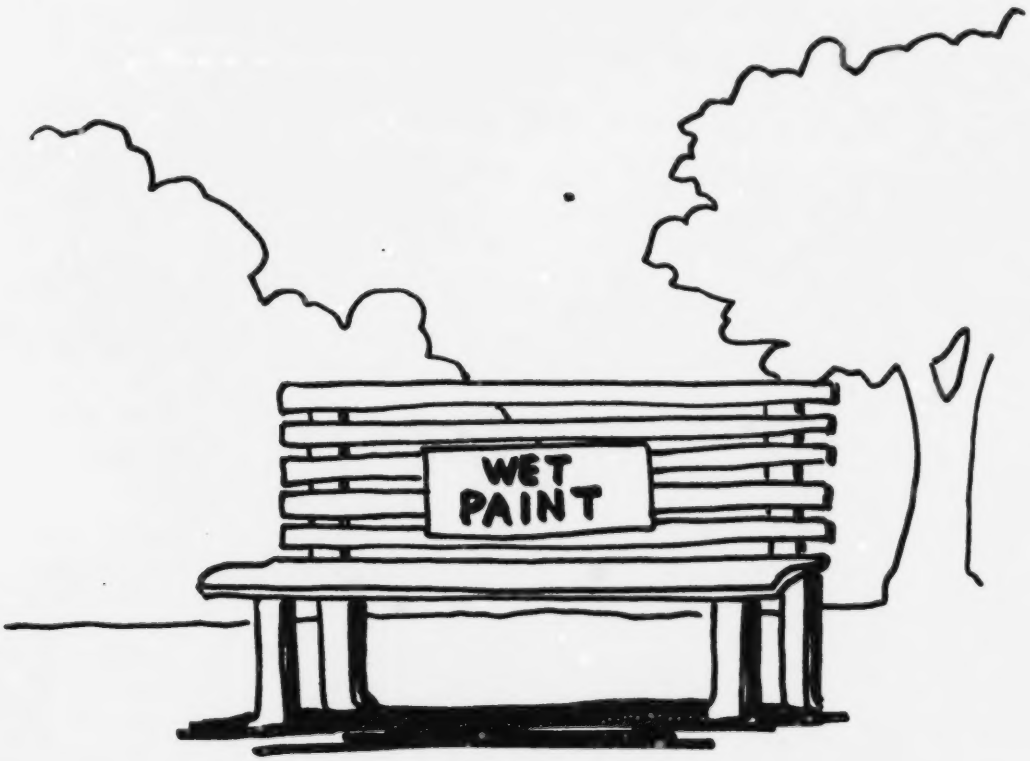
The best way to get a job as a painter is to enter an apprenticeship program. Most apprenticeships take three years. As an apprentice, you will work on the job with experienced painters while you learn about painting. You will also attend classes to learn about the use of tools, paint mixing and matching, blueprint reading, and safety.

DEFINITION

*A **blueprint** is a picture that shows how something is to be built or put together.

Another way to learn about the work of a painter is to get a job as a painter's helper. As a painter's helper, you will receive on-the-job training. You will carry supplies, put up scaffolds, prepare surfaces, and do simple tasks while you learn about the different kinds of paint. You will also watch experienced painters while they work. As you gain experience and show that you can do the work, you will be allowed to do some painting.

Taking every chance to learn new skills and tasks will help you do a better job. Good math skills will also help you perform your work as a painter.



DO YOU WANT TO DO MORE PAINTER'S MATH?

Practice Exercise E

Find the area in each problem. Remember: A = l x w

27. What is the area of a wall 23 feet long and 12 feet high?

28. What is the area of a wall 27 feet long and 12 feet high?

29. What is the area of a wall 35 feet long and 17 feet high?

30. A side of a building is 72 feet long and 90 feet high. What is the area?

31. A side of a building is 60 feet long and 60 feet high. What is the area?

32. A bedroom wall is 19 feet long and 9 feet high. What is the area?

Practice Exercise F

Use the chart below to answer the following questions:

Size of Can	Surface Area Covered
gallon	200 square feet
quart	50 square feet
pint	25 square feet

How many gallons of paint are needed to paint--

33. 600 square feet?
34. 1,350 square feet?
35. 1,400 square feet?

How many quarts of paint are needed to paint--

36. 600 square feet?
37. 1,350 square feet?
38. 1,400 square feet?

How many pints of paint are needed to paint--

39. 250 square feet?
40. 290 square feet?
41. 230 square feet?

Practice Exercise G

One gallon of paint costs $11.75. The labor charge per hour is $13.79. Find the total cost for each problem.

	Paint Used (in gallons)	Cost of Materials	Hours Worked	Cost of Labor	Total Cost
42.	9	?	10	?	?
43.	15	?	21	?	?
44.	17	?	23	?	?
45.	45	?	81	?	?
46.	63	?	97	?	?
47.	70	?	102	?	?

Practice Exercise H

To make Skylark Blue paint, a painter mixes:

1 part white paint
1 part yellow paint
2 parts blue paint

48. If a painter mixes 1 gallon of paint, how many quarts of each ingredient are used?

49. A painter wants to mix 16 gallons of paint. How many gallons of white, yellow, and blue paint are needed?

50. A painter mixed 64 gallons of paint. How many gallons of each ingredient were used?

51. A painter used 32 gallons of white paint to mix a 128-gallon batch. How many gallons of yellow and blue paint were used?

52. A painter used 96 gallons of blue paint to mix a batch of paint. How many gallons of white and yellow paint were used? How many gallons are there in the batch?

DO YOU WANT TO EXPLORE SOME MORE?

1. Measure the size of your bedroom. Calculate the area of the walls. Figure out how many gallons of paint you would need to paint the walls.

2. Go to a paint store. Look at the different colors of paint that are available. Count how many different types of white, blue, green, yellow, and red paint are available. Can you see the difference between the colors? What color would you use for your bedroom?

3. While you are at the paint store--

   - look at the different sizes and shapes of brushes. Try to decide when you would use the different types. Ask the sales clerk to explain some of the differences to you.

   - figure out how much the paint and brushes would cost to paint your bedroom.

   - read information on the paint cans and other products in the store.

   - watch a sales clerk mix paint for a customer. Notice the machines and pieces of equipment the sales clerk uses.

4. Look in the newspaper for any ads selling paint. Try to get an idea of how much the different kinds of paint cost. Figure out how much less paint costs when it is on sale.

5. Are you interested in other jobs similar to that of a painter?

   - Paperhangers cover walls and ceilings with decorative wallpaper, fabric, or vinyl.

   - Plasterers coat walls with a pasty substance that hardens as it dries, so that the wall can be painted or papered.

   - Cement masons smooth and finish the surfaces of poured concrete floors, walls, sidewalks, or curbs.

   You must have good math skills to do these jobs well. All of these workers use addition, subtraction, multiplication, and division on the job every day.

GLOSSARY

Area: the amount of surface to be covered when you paint a room, a wall, or a ceiling. The surface is measured in square units (for example, square inches, square feet, or square yards).

Asterisk (*): a mark that tells you to look at the bottom of the page for the meaning, or definition, of the word.

Blueprint: a picture that shows how something is to be built or put together.

Glossary: a list of words with their meanings.

Masonry: something built with stones or bricks.

Scaffold: a temporary or moveable platform that workers stand or sit on when working at a height above the floor or ground.

Stencil: a sheet with a cut pattern.

Trim: the woodwork around doors and windows.

ANSWER SHEET

Practice Exercise A

1. 136 square feet
2. 117 square feet
3. 260 square feet
4. 4,125 square feet
5. 5,700 square feet
6. 264 square feet

Practice Exercise B

7. 2
8. 3
9. 4
10. 2
11. 3
12. 8
13. 3
14. 2
15. 8

Practice Exercise C

16. $39.92; 75.00; 114.92
17. $49.90; 100.0; 149.90
18. $109.78; 125.00; 234.78
19. $129.74; 137.50; 267.24
20. $219.56; 437.50; 657.06
21. $429.14; 800.00; 1,229.14

Practice Exercise D

22. 2 quarts white
    2 quarts blue
    4 quarts yellow
23. 3 quarts white
    3 quarts blue
    6 quarts yellow
24. 1 gallon white
    1 gallons blue
    2 gallons yellow
25. 2 gallons blue
    4 gallons yellow
26. 8 gallons white
    32 gallons

Practice Exercise E

27. 276 square feet
28. 324 square feet
29. 595 square feet
30. 6,480 square feet
31. 3,600 square feet
32. 171 square feet

Practice Exercise F

33. 3
34. 7
35. 7
36. 12
37. 27
38. 28
39. 10
40. 12
41. 10

Practice Exercise G

42. $105.75; 137.90; 243.65
43. $176.25; 289.59; 465.84
44. $199.75; 317.17; 516.92
45. $528.75; 1,116.99; 1,645.74
46. $740.25; 1,337.63; 2,077.88
47. $822.50; 1,406.58; 2,229.08

Practice Exercise H

48. 1 quart white
    1 quart yellow
    2 quarts blue
49. 4 gallons white
    4 gallons yellow
    8 gallons blue
50. 16 gallons white
    16 gallons yellow
    32 gallons blue
51. 32 gallons yellow
    64 gallons blue
52. 48 gallons white
    48 gallons yellow
    192 gallons